

Amendment
Serial No. 10/712,962

IN THE CLAIMS

Please amend the claim as follows:

1. (Currently Amended) An optical cross-connect device for communication between first and second optical networks communicating with each other using forward and backward optical signals each comprising a plurality of channels, said optical cross-connect device comprising:

a first circulating part having first through fourth ports that are configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port, the first circulating part being connected at the first and third ports thereof to a first optical network;

a second circulating part having first through fourth ports that are configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port, the second circulating part being connected at the first and third ports thereof to a second optical network while being connected at the second and fourth ports thereof to the second and fourth ports of the first circulating part, respectively;

a first reflecting part being connected to respective second ports of the first and second circulating parts, being configured to input the forward optical signal, being configured to reflect at least one channel of the forward optical signal, and being configured to allow at least one channel that is not reflected to pass therethrough; and

a second reflecting part being connected to respective fourth ports of the first and second circulating parts, being configured to input the backward optical signal, being configured to reflect at least one channel of the backward optical signal, and being configured to allow at least one channel that is not reflected to pass therethrough;

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wherein the first circulating part comprises: a first circulator having a plurality of ports including the first and second ports of the first circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port; and a second circulator having a plurality of ports including the third and fourth ports of the first circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port, and wherein the first and second circulators are connected to each other in a double-port-connected configuration.

2. (Previously presented) The optical cross-connect device according to claim 1, wherein each of the first and second reflecting parts comprises a plurality of fiber Bragg gratings (FBG), each of which being adapted to allow an optical signal input thereto to pass through or to reflect only a predetermined channel of the optical signal in accordance with an ON or OFF state thereof.

3. (Cancelled).

4. (Currently Amended) The optical cross-connect device according to claim 3 1, wherein the second circulating part comprises:

a third circulator having a plurality of ports including the first and second ports of the second circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port; and

a fourth circulator having a plurality of ports including the third and fourth ports of the

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second circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port;

wherein the third and fourth circulators are connected to each other in a double-port-connected configuration.

5. (Currently Amended) An optical cross-connect device for communication between first and second optical networks communicating with each other using forward and backward optical signals each comprising a plurality of channels, said optical cross-connect device comprising:

a first circulating part having first through fourth ports that are configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port, the first circulating part being connected at the first and third ports thereof to a first optical network;

a second circulating part having first through fourth ports that are configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port, the second circulating part being connected at the first and third ports thereof to a second optical network while being connected at the second and fourth ports thereof to the second and fourth ports of the first circulating part, respectively;

a first reflecting part being connected to respective second ports of the first and second circulating parts, being configured to input the forward optical signal, being configured to reflect at least one channel of the forward optical signal, and being configured to allow at least one channel that is not reflected to pass therethrough; and

a second reflecting part being connected to respective fourth ports of the first and second circulating parts, being configured to input the backward optical signal, being configured to

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reflect at least one channel of the backward optical signal, and being configured to allow at least one channel that is not reflected to pass therethrough,

wherein the first circulating part comprises: a first circulator having a plurality of ports including the first port of the first circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port; a second circulator having a plurality of ports including the second port of the first circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port; and a third circulator having a plurality of ports including the third and fourth ports of the first circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port, and wherein the first through third circulators are port-connected to one another.

6. (Previously presented) The optical cross-connect device according to claim 5, wherein the second circulating part comprises:

a fourth circulator having a plurality of ports including the first port of the second circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port;

a fifth circulator having a plurality of ports including the second port of the second circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port; and

a sixth circulator having a plurality of ports including the third and fourth ports of the second circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port,

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wherein the fourth through sixth circulators are port-connected to one another.

7. (Currently Amended) An optical cross-connect device for communication between first and second optical networks communicating with each other using forward and backward optical signals, each comprising a plurality of channels, said optical cross-connect device comprising:

a first circulating part having first through fourth ports that are configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port, the first circulating part being connected at the first and third ports thereof to a first optical network;

a second circulating part having first through fourth ports that are configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port, the second circulating part being connected at the first and third ports thereof to a second optical network while being connected at the second and fourth ports thereof to the second and fourth ports of the first circulating part, respectively;

a first reflecting part being connected to respective second ports of the first and second circulating parts, being configured to input the forward optical signal, being configured to reflect at least one channel of the forward optical signal, and being configured to allow at least one channel that is not reflected to pass therethrough; and

a second reflecting part being connected to respective fourth ports of the first and second circulating parts, being configured to input the backward optical signal, being configured to reflect at least one channel of the backward optical signal, and being configured to allow at least one channel that is not reflected to pass therethrough.

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wherein the first circulating part comprises: a first circulator having a plurality of ports including the first port of the first circulating part while configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port; a second circulator having a plurality of ports including the third port of the first circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port; and a third circulator having a plurality of ports including the second and fourth ports of the first circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port, and wherein the first through third circulators are port-connected to one another.

8. (Previously presented) The optical cross-connect device according to claim 7, wherein the second circulating part comprises:

a fourth circulator having a plurality of ports including the first port of the second circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port;

a fifth circulator having a plurality of ports including the third port of the second circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port; and

a sixth circulator having a plurality of ports including the second and fourth ports of the second circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port,

wherein the fourth through sixth circulators are port-connected to one another.

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9. (Currently Amended) An optical cross-connect device for communication between first and second optical networks communicating with each other using forward and backward optical signals each comprising a plurality of channels, said optical cross-connect device comprising:

a first circulating part having first through fourth ports that are configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port, the first circulating part being connected at the first and third ports thereof to a first optical network;

a second circulating part having first through fourth ports that are configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port, the second circulating part being connected at the first and third ports thereof to a second optical network while being connected at the second and fourth ports thereof to the second and fourth ports of the first circulating part, respectively;

a first reflecting part being connected to respective second ports of the first and second circulating parts, being configured to input the forward optical signal, being configured to reflect at least one channel of the forward optical signal, and being configured to allow at least one channel that is not reflected to pass therethrough; and

a second reflecting part being connected to respective fourth ports of the first and second circulating parts, being configured to input the backward optical signal, being configured to reflect at least one channel of the backward optical signal, and being configured to allow at least one channel that is not reflected to pass therethrough.

wherein the first circulating part comprises: a first circulator having a plurality of ports including the first port of the first circulating part being configured to output an optical signal,

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which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port; a second circulator having a plurality of ports including the second port of the first circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port; a third circulator having a plurality of ports including the third port of the first circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port; and a fourth circulator having a plurality of ports including the fourth port of the first circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port, and wherein the first through fourth circulators are port-connected to one another.

10. (Currently Amended) The optical cross-connect device according to claim 9, wherein the second circulating part comprises:

a fifth circulator having a plurality of ports including the first port of the second circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port;

a sixth circulator having a plurality of ports including the second port of the second circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port;

a seventh circulator having a plurality of ports including the third port of the second circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port; and

a eighth circulator having a plurality of ports including the fourth port of the second

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circulating part being configured to output an optical signal, which is input to a higher-order port thereof, from a lower-order port thereof arranged adjacent to the higher-order port,

wherein the fifth through eighth ~~sixth~~ circulators are port-connected to one another.

11. (Currently amended) The optical cross-connect device according to claim 1, wherein the optical cross-connect device is configured such that the forward optical signals is input to the first reflecting part only once.

12. (Currently amended) The optical cross-connect device according to claim 1, wherein the optical cross-connect device is configured such that the backward optical signals is are input to the second reflecting part only once.

13. (Previously presented) The optical cross-connect device according to claim 1, wherein the optical cross-connect device is configured to input forward and backward optical signals.